

Emotion Detection in Social Media Posts Using Deep Learning Techniques

Ms. Anjali Kiran Yadav

Student, Master of Science Information Technology, SDSM College Palghar(W) - 401404

Abstract- With the increasing use of social media as it is a platform for self-expression, emotion detection from user-generated content has become a valuable tool for understanding public mood and behavior. This paper proposes a deep learning approach for detecting multiple emotions-such as anger, joy, sadness, fear, and surprise-from textual data extracted from Twitter. We employ pre-trained transformer models such as BERT and Roberta and compare their performance with traditional LSTM-based models. The results demonstrate the superiority of transformer-based architectures in capturing nuanced emotional expressions, even in noisy and informal text data.

I. INTRODUCTION

Social media platforms like Twitter and Facebook have become rich sources of data for understanding human behavior. Unlike traditional sentiment analysis, which focuses on binary classification (positive/negative), emotion detection seeks to uncover more complex emotional states. This provides greater insight into user experiences, mental health trends, and real-time public reactions to events. The aim of this research is to apply and evaluate state-of-the-art deep learning techniques for multi-class emotion classification on social media text.

II. RELATED WORK

Previous work in emotion detection includes lexicon-based approaches (NRC Emotion Lexicon), rule-based systems, and traditional machine learning classifiers (SVM, Naive Bayes). More recently, deep learning models such as LSTM and transformer-based models like BERT have shown significant improvements in performance across NLP tasks. Researchers have also explored multi-label emotion classification and cross-lingual emotion analysis.

III. DATASET

We use the Go Emotions dataset by Google, containing 58,000 Reddit comments annotated with 27 emotion labels. The dataset is mapped to 6 primary Ekman emotions (joy, sadness, fear, anger, surprise, disgust) for simplification. Additional experiments are performed using emotion-labeled tweets from the Emotion X dataset for social media specificity.

IV. METHODOLOGY

Preprocessing steps include tokenization, stop word removal, lowercasing, and emoji normalization. We used LSTM with Glove embeddings, BERT-base-uncased, and Roberta-base models. Training was done using the Adam optimizer with a learning rate of $2e-5$, batch size 16, and for 5 epochs. We used accuracy and F1-score for evaluation.

V. RESULTS AND EVALUATION

Roberta outperformed all models in detecting subtle emotions. The model was particularly effective in distinguishing fear and anger, which are often confused.

Model	Accuracy	Macro F1-score
LSTM + Glove	68.3%	0.65
BERT-base	79.1%	0.76
Roberta-base	82.4%	0.80

VI. DISCUSSION

The results validate that transformer-based models outperform traditional models in emotion classification. However, challenges remain: sarcasm and ambiguity degrade performance, and imbalanced datasets hinder the detection of rare emotions. Fine-tuning on domain-specific data enhances accuracy.

VII. APPLICATIONS

This research can benefit mental health monitoring, brand sentiment tracking, and disaster response systems using emotion-aware signals.

VIII. CONCLUSION

Emotion detection in social media is a complex but increasingly important NLP task. Transformer-based models like Roberta demonstrate high performance, suggesting their potential in real-time emotion-aware applications. Future work will explore multilingual models and multi-modal emotion detection using images and videos.

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